



3 NATURAL RESOURCES

INTRODUCTION

Chimney Rock State Park is located on the eastern edge of the Blue Ridge Mountains in the southern Appalachian Mountain range. These mountains are some of the oldest on earth, escaping glaciation during the last ice age and harboring animal and plant life for millions of years – longer than any other region in the United States. The Hickory Nut Gorge region features a subtropical climate and is the second wettest in the United States. The topography is diverse with elevations ranging from the hundreds of feet to 6,684 feet at Mount Mitchell, the highest point in the eastern United States. Due to these topographic and climatic factors, the southern Appalachians host a number of different natural communities and boast some of the greatest biodiversity in the world.

Chimney Rock State Park is one example of the diversity of the southern Appalachians. The park is a tremendous natural resource, containing high quality, intact, and unique natural communities, rare species of plants and animals, rock outcrops, steep slopes, balds, and waterfalls.

Figure 3.1 shows aerial photography of Chimney Rock State Park and the surrounding study area. This image is comprised of orthophotography data from Polk (2003), Henderson (2007), Rutherford (2005), and Buncombe (2006) counties and provides a glimpse of existing development and the terrain of the park and surrounding study area.

TOPOGRAPHY AND ELEVATION

TOPOGRAPHY

Figure 3.2 features 20-foot topographic contours for Chimney Rock State Park and the surrounding study area. The map is comprised of 2007 Light Detection and Ranging (LIDAR) data provided by the North Carolina Department of Transportation for Henderson, Rutherford, Buncombe, and Polk counties. The contours show the dramatic landscape, ranging from steep mountains to deep river valleys in the park and surrounding region. The steep protruding cliffs of Chimney Rock, Rumbling Bald and other mountains are indicated by the tight, almost overlapping contour lines.

ELEVATION

Figure 3.3 illustrates the elevation ranges within the park boundaries and surrounding study area. The elevation within the study area ranges from approximately 989 feet near Lake Lure to 3,966 feet atop Sugarloaf Mountain. The second highest point in the study area is Shumont Mountain at 3,842 feet. These substantial changes in elevation represent design challenges for buildings, trails, and other facilities. The data for this map is from the 2007 LIDAR data.

FIGURE 3.1: STUDY AREA AERIAL IMAGERY

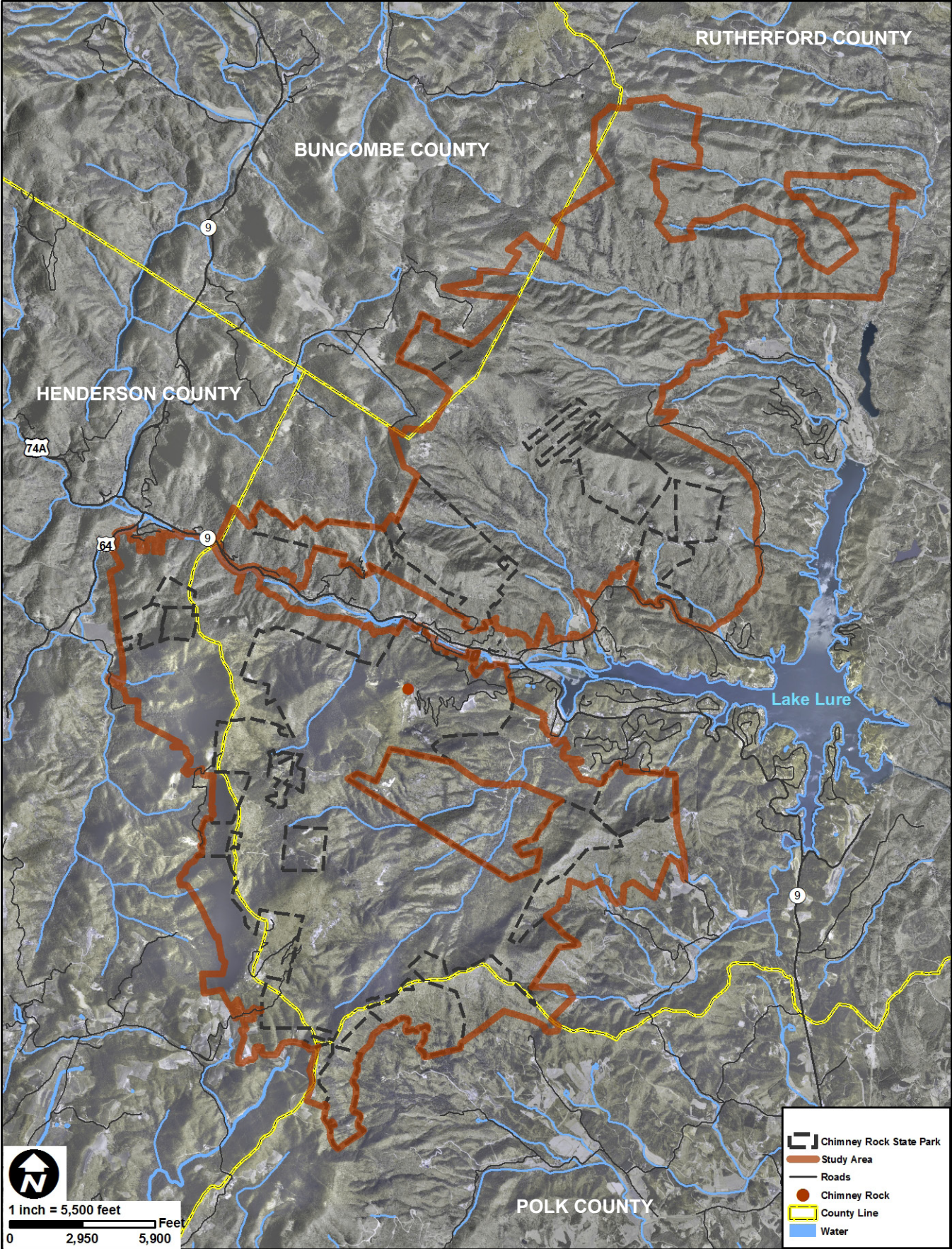




FIGURE 3.2: STUDY AREA TOPOGRAPHY

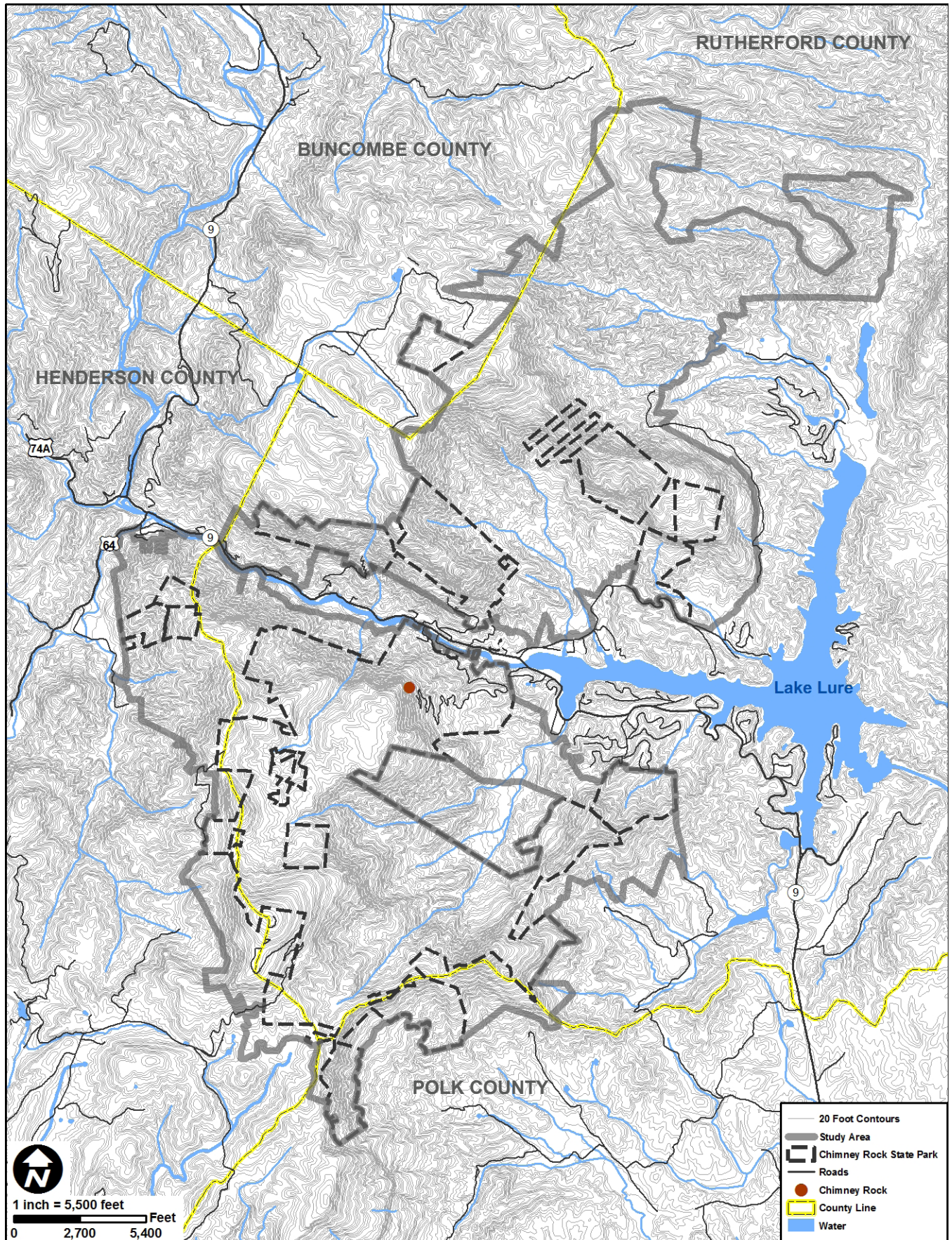
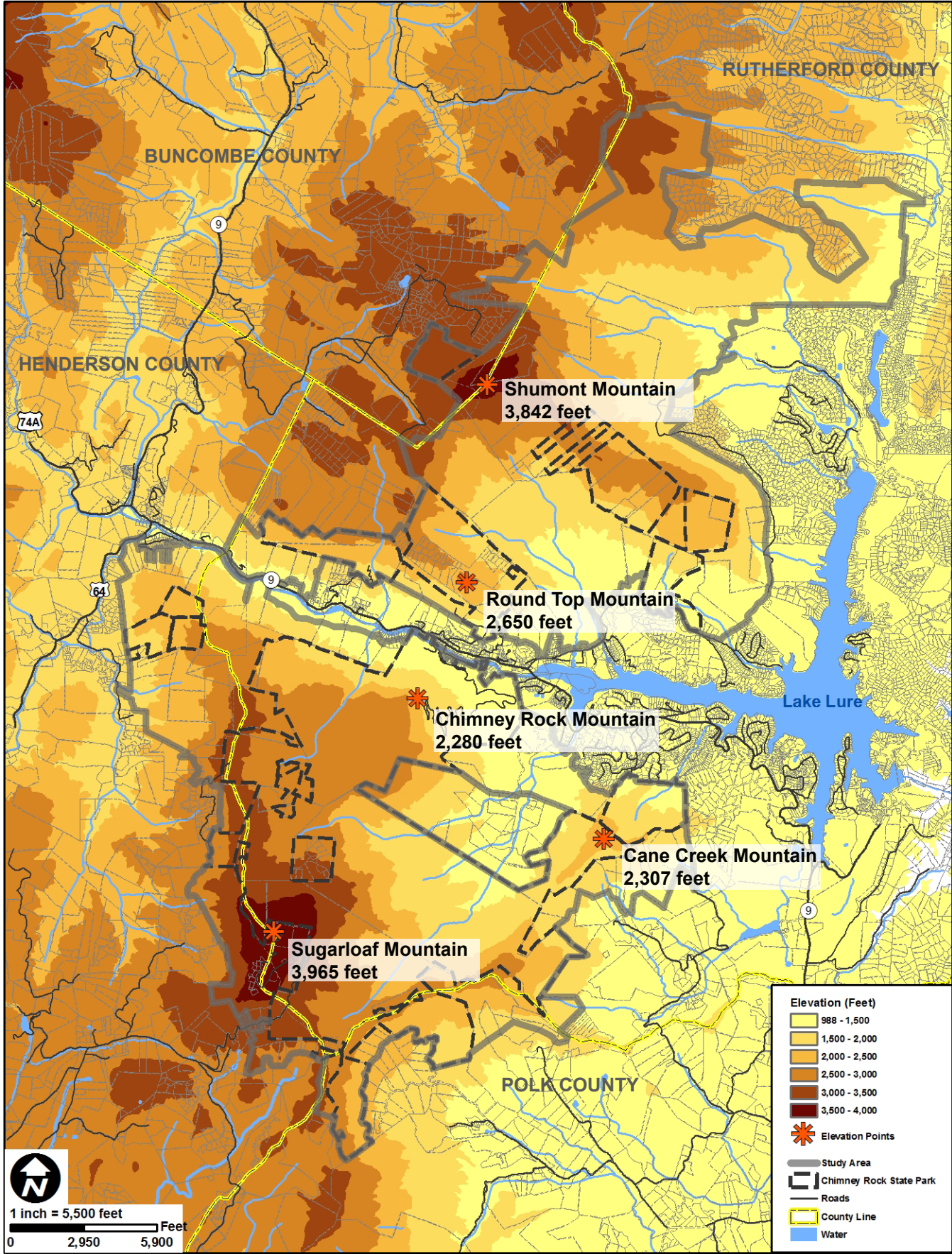


FIGURE 3.3: STUDY AREA ELEVATION





SLOPE AND ASPECT

SLOPE

Figure 3.4 displays slopes in percentages utilizing 2007 LIDAR data. This data is not survey quality; therefore, detailed topographic surveys should be conducted during the design development phase for any proposed construction project within park boundaries.

Steep cliffs, overhanging rocks, and tall waterfalls have helped define the Hickory Nut Gorge region. These topographic features dominate the landscape in and around the park.

The two shades of green on the map identify slopes less than 18 percent where development may potentially occur. As indicated by the map, there are very limited areas where this condition can be met. The majority of steep slopes (20 percent or greater) comprise 87 percent of the park and surrounding study area. The maximum conditions for slope with various development-related activities are as follows:

0-10%	Easily buildable and pedestrian accessible; ideal for roads and trails.
11-18%	Maximum buildable slopes for roads
19-30%	Maximum buildable slopes; septic capable
31-65%	Steepest provisionally for on-site sewer
>65%	Unbuildable

ASPECT

Figure 3.5 illustrates aspect in the park and study area. Aspect is the direction that land faces from north (0°) going clockwise towards east (90°) and so forth back to north (360°), and in turn has an effect on micro communities. Generally, south-facing slopes receive more sunlight, have drier soils and have higher temperature microclimates. North-facing slopes receive more shade and are typically more moist. Species that thrive in moist conditions, such as ferns and rhododendron are typically found on north-facing slopes. Typically, west-facing slopes have higher temperatures than east-facing slopes due to the direct afternoon sun exposure. South-facing slopes are ideal when planning buildings and public use areas utilizing energy-efficient techniques and solar energy harvesting. The map represents south-facing aspects in yellow and pink and north-facing aspects in blue. As indicated by the map, most of the existing facilities at Chimney Rock State Park are located on north-facing slopes.



View into the Hickory Nut Gorge valley from the Opera Box

FIGURE 3.4: STUDY AREA SLOPE

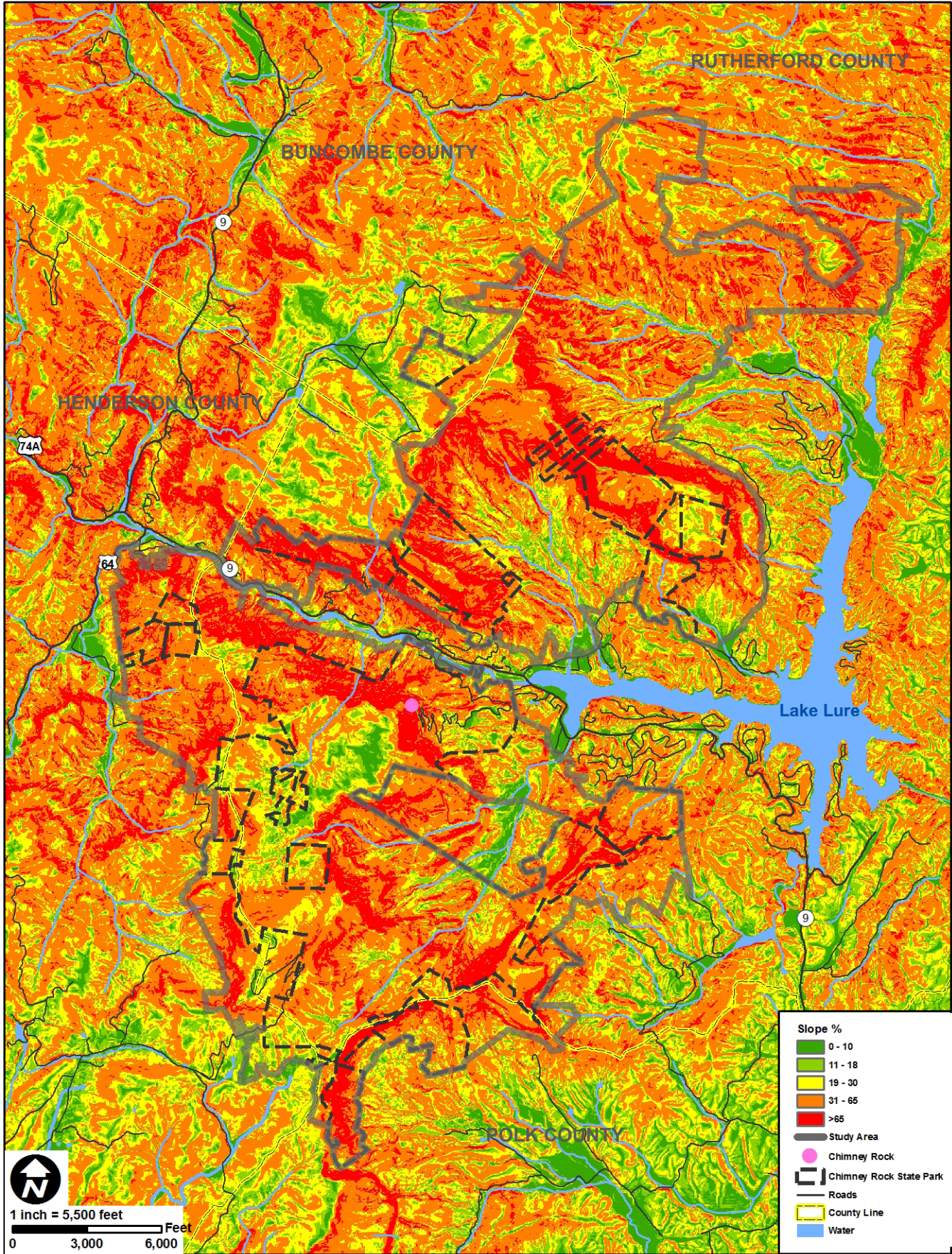
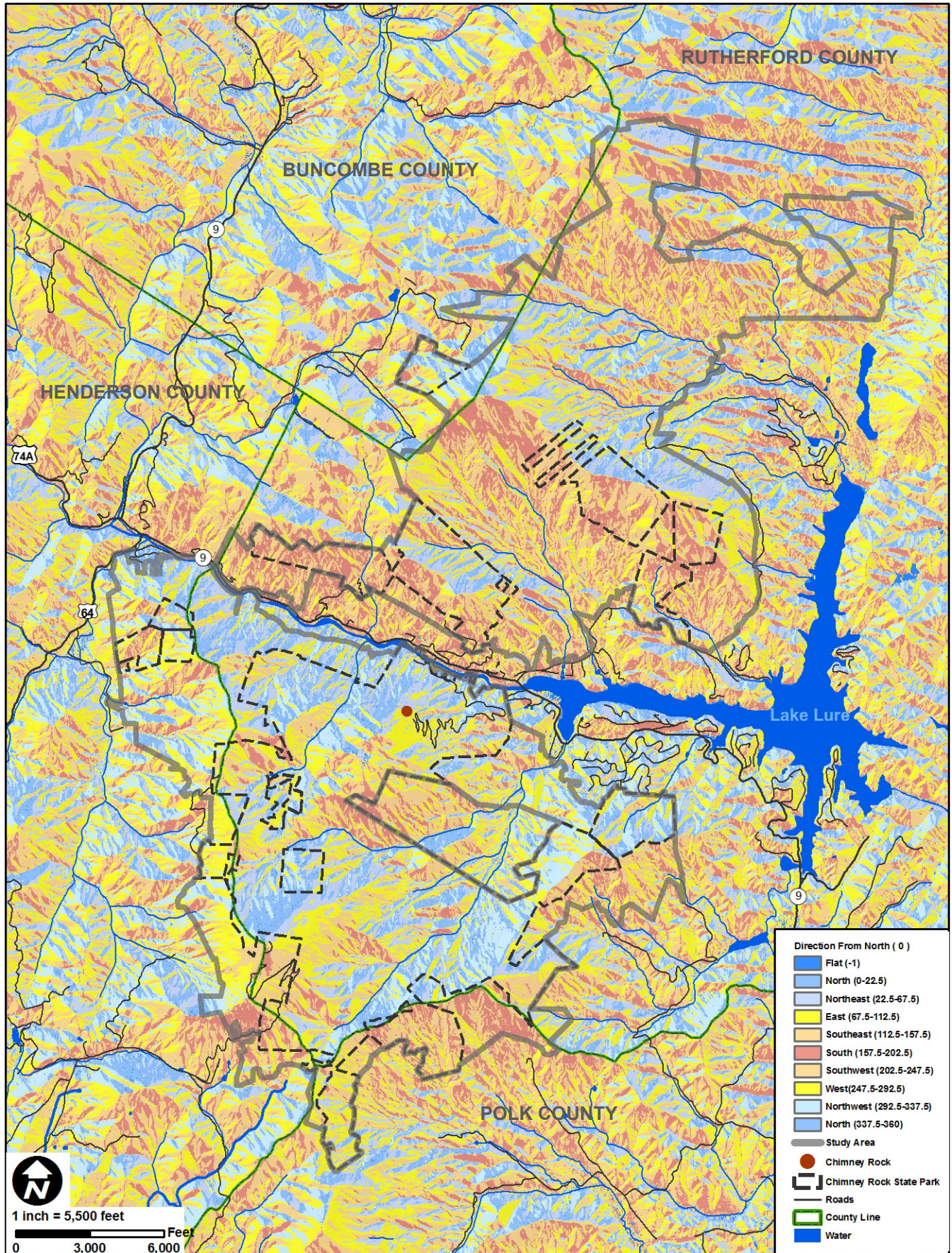


FIGURE 3.5: STUDY AREA ASPECT





CLIMATE

The southern Appalachian Mountains feature a subtropical wet climate, with some of the highest annual precipitation averages in the country outside the Pacific Northwest. Topography contributes to distinct microclimates on peaks and in valleys and coves. Precipitation, winds, and temperature are highly variable in the mountainous terrain of the study area, with elevation ranging from near 1,000 feet to 4,000 feet and slope and aspect playing major roles in determining temperature and moisture levels. Typically, temperature drops with increases in elevation. The lapse rate for a standard atmosphere is about 3.5° F per 1,000 feet, meaning that the range of temperatures in the study area is likely more than 10 degrees F. Due to many factors, the lapse rate will vary day to day and even throughout the day based on clouds, rainfall, and other factors.

Detailed 1971-2000 climatic norms data comes from the State Climate Office of North Carolina. Data availability varies by station. The information below is provided by the North Carolina Climate Office. Three sources of data are provided due to lack of available data from the Lake Lure station. At Lake Lure, the average monthly precipitation ranges from 4.03 inches in December to 5.96 inches in August. The average annual rainfall is 57.6 inches. At Tryon, NC (15 miles from the study area), the average maximum temperature ranges from 51.9 degrees F in January to 89.1 degrees F in July. Average minimum temperatures range from 30.3 degrees F in January to 66.8 degrees F in July. In Asheville (24 miles from the study area), the average annual snowfall is 15 inches.

The park is located in the vicinity of latitude 35.421 degrees north and longitude -82.188 degrees west. This latitude reflects a solar azimuth angle (angle of sun relative to the horizon) of 33 degrees on the winter solstice and approximately 79 degrees on the summer solstice. This information is useful for siting buildings and other structures for energy efficiency and solar comfort, both important in designing for sustainability.

HYDROLOGY

The State of North Carolina contains all or portions of 17 river basins as seen within Figure 3.6. Chimney Rock State Park and the study area fall within the Broad River basin, and more specifically within the Upper Broad River Sub-basin (Figure 3.7). The study area also contains a number of named streams and rivers as seen in Figure 3.8.

The Rocky Broad River is the largest river within the park study area and originates in the western mountains of North Carolina. It flows southeast through the Foothills and Piedmont before entering South Carolina. The Rocky Broad River has four major tributaries, which include the Green, First Broad, Second Broad and North Pacolet rivers. The study area also includes a number of small reservoirs.

Figure 3.8 illustrates the various hydrological features within the Chimney Rock State Park study area, including Lake Lure and the Rocky Broad River and its tributaries. Streams to the south of Sugarloaf Mountain flow into the Green River and the Hungry River. Within this area, there are 165 N.C. Division of Water Quality (NCDWQ)-classified stream segments. Of these classifications, the two main classifications found are “B” and “C.” These main classifications are combined with “Tr,” a supplemental classification.

The highest quality classifications for streams and rivers are High Quality Waters and Outstanding Resource Waters. None of the rivers or streams within Chimney Rock State Park or the surrounding study area have either classification. The specific classifications found within the study area are “B-Tr,” “C,” and “C-Tr.”

- **Class B** (17 segments classified as “B-Tr”)

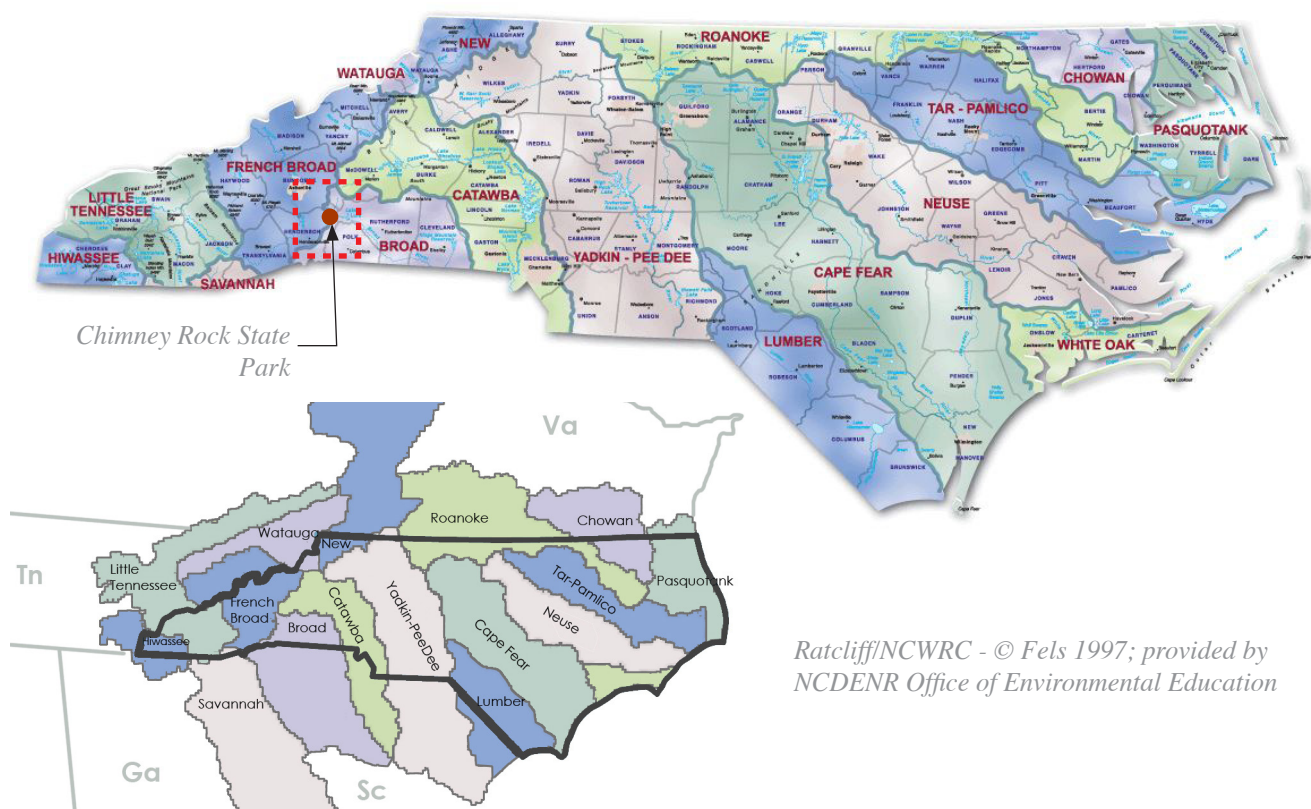
Waters protected for all Class C uses in addition to primary recreation. Primary recreational activities include swimming, skin diving, water skiing, and similar uses involving human body contact with water where such activities take place in an organized manner or on a frequent basis.

- **Class C** (11 segments classified as “C” and 137 segments classified as “C-Tr”)

Waters protected for uses such as secondary recreation, fishing, wildlife, fish consumption, aquatic life



FIGURE 3.6: NORTH CAROLINA RIVER BASINS



*Ratcliff/NCWRC - © Fels 1997; provided by
NCDENR Office of Environmental Education*

including propagation, survival and maintenance of biological integrity, and agriculture. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner.

• Trout Waters (Tr)

Supplemental classification intended to protect freshwaters that have conditions that sustain and allow for trout propagation and survival of stocked trout on a year-round basis.

Floodplain and wetlands within Chimney Rock State Park and the surrounding study area are scarce due to the mountainous topography of the area. Floodplain can be seen along a few of the stream and river basins such as Cane Creek and the Rocky Broad River in Figure 3.8 (data provided by the N.C. Division of Emergency Management 2007). Wetlands are only found around Lake Lure, and do not appear on Figure 3.8 due to the scale of the data (data provided by the U.S. Fish and Wildlife Service 2007).

Protection of water quality is an important aspect of the park's role in conservation. Those waters classified as Tr (the majority of waters in the study area) require maintenance of a 25-foot vegetative buffer on both sides based on State of North Carolina regulation. Additionally, surface waters within the park are subject to jurisdictional oversight by the U.S. Army Corps of Engineers and the NCDWQ under Sections 401 and 404 of the Clean Water Act.

FIGURE 3.7: RIVER SUBBASINS

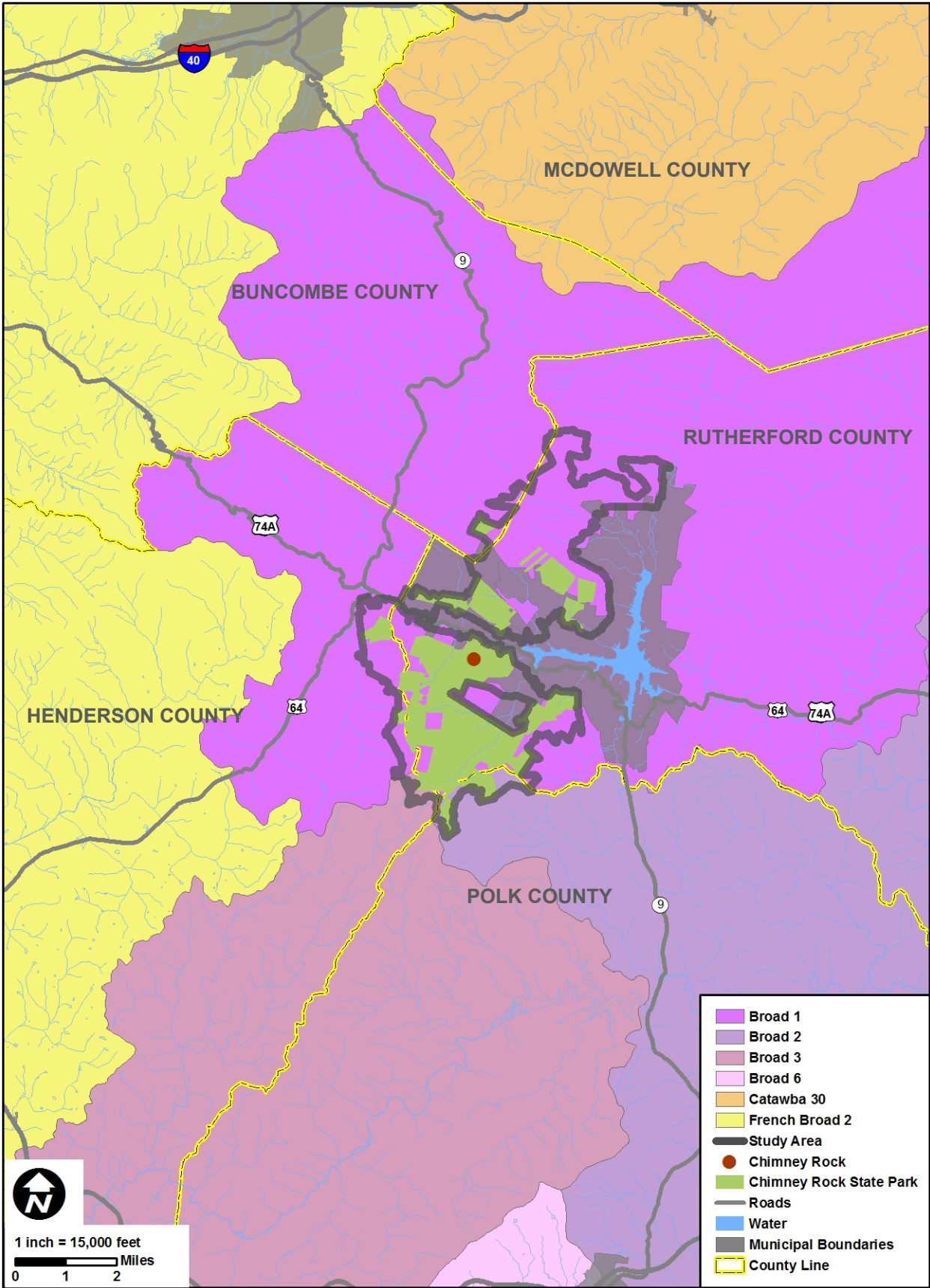
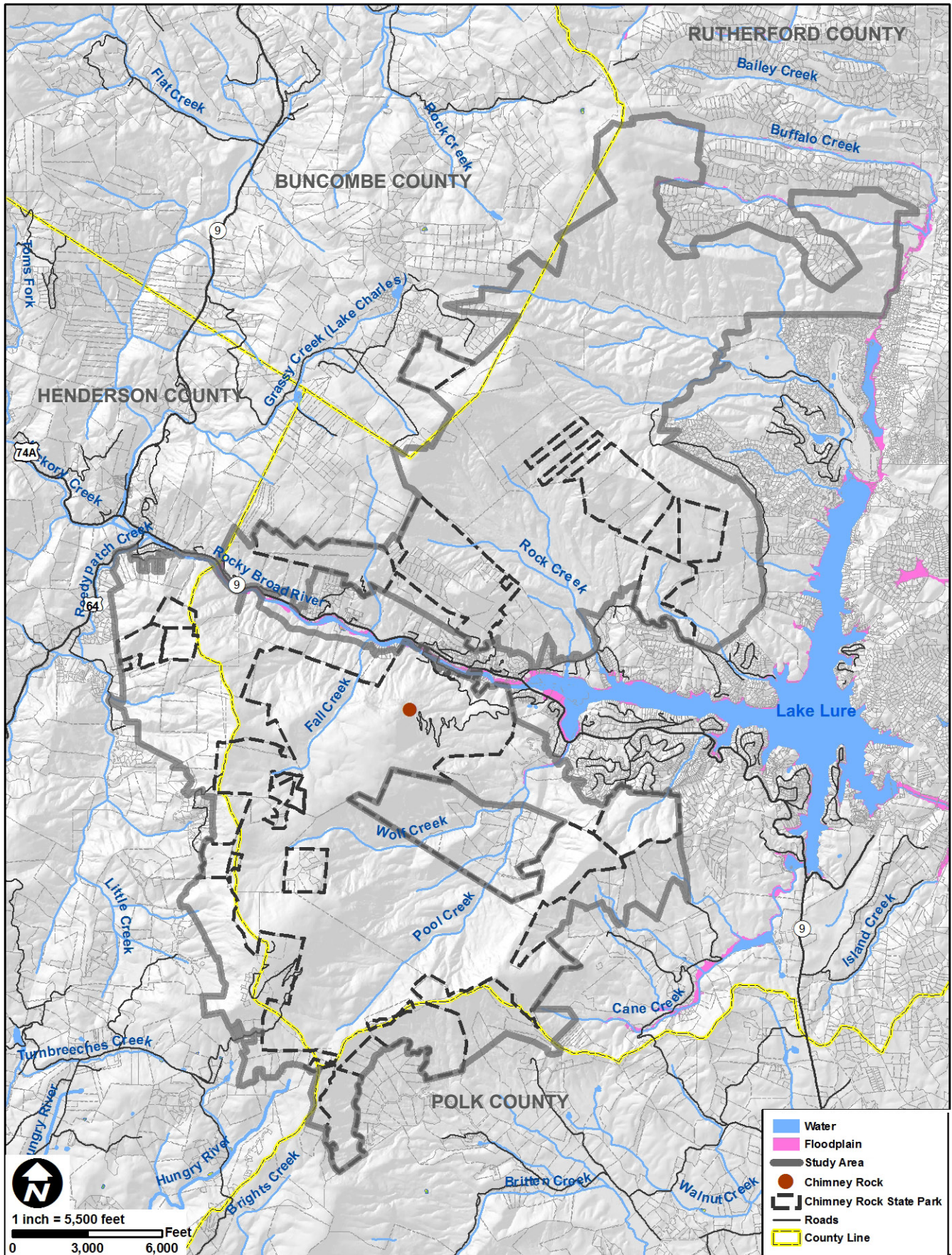


FIGURE 3.8: STUDY AREA HYDROLOGY





GEOLOGY

Chimney Rock State Park is located within the Inner Piedmont Belt, which is the most intensely distorted and metamorphosed segment of the Piedmont. The metamorphic rocks range from 500 to 750 million years in age. They include gneiss and schist that have been intruded by younger granite rocks (See Figure 3.9 from the N.C. Geological Survey).

Figure 3.10 illustrates the geology of the park and surrounding study areas as characterized by the N.C. Geological Survey (1998). Primarily the area is Henderson Gneiss, Porphyroblastic Gneiss, Biotite Gneiss and Schist. The feature of Chimney Rock is Henderson Gneiss while Rumbling Bald is Henderson Gneiss and Biotite Gneiss and Schist. To the south, Sugarloaf Mountain contains Caesars Head Granite Gneiss, Granite Gneiss, and Garnet Mica Schist.

The 1998 NCGS data also indicates the presence of one large fault paralleling U.S. Route 64/74A and the Rocky Broad River from the west to Chimney Rock State Park in the east. One smaller fault is also found in the south-eastern study area by Cane Creek Mountain. An additional fault outside the study area by the Hungry River is also shown in Figure 3.10.

The study area holds dozens of fissure caves and includes two of the world's longest augengneiss fissure caves at Bat Cave, which is owned and managed by The Nature Conservancy and Rumbling Bald. The caves' hibernaculum qualities make them a valuable resource for animals.

Due to the geologic conditions of the study area, further geotechnical studies may be required during the design development phase for any proposed construction project within the park.

FIGURE 3.9: NORTH CAROLINA GEOLOGY

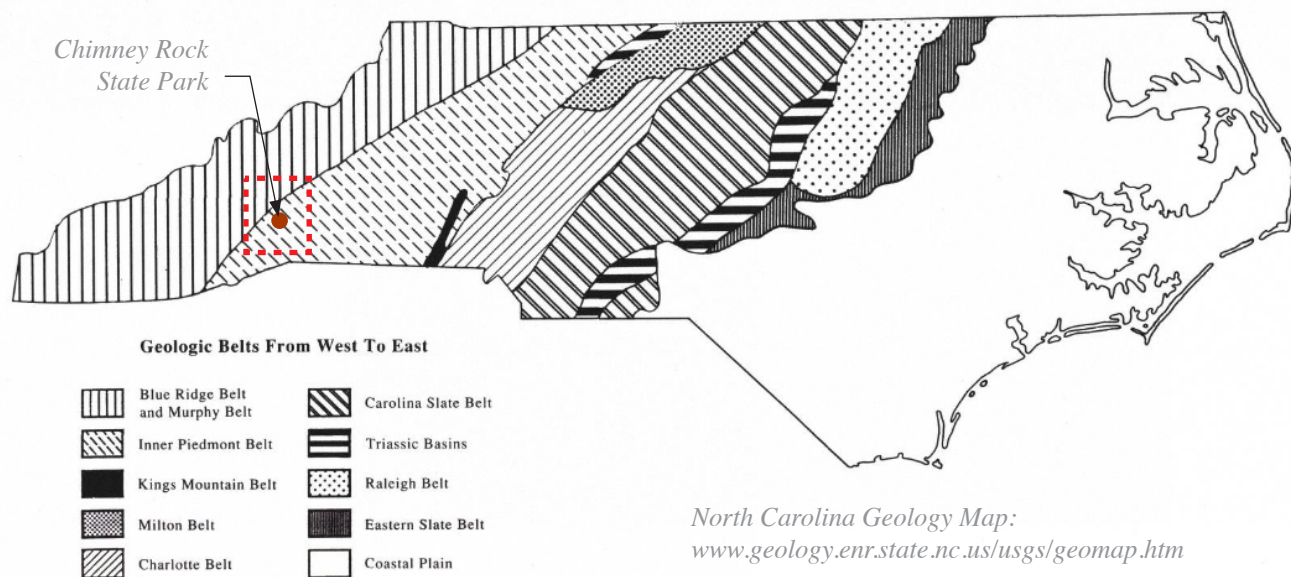
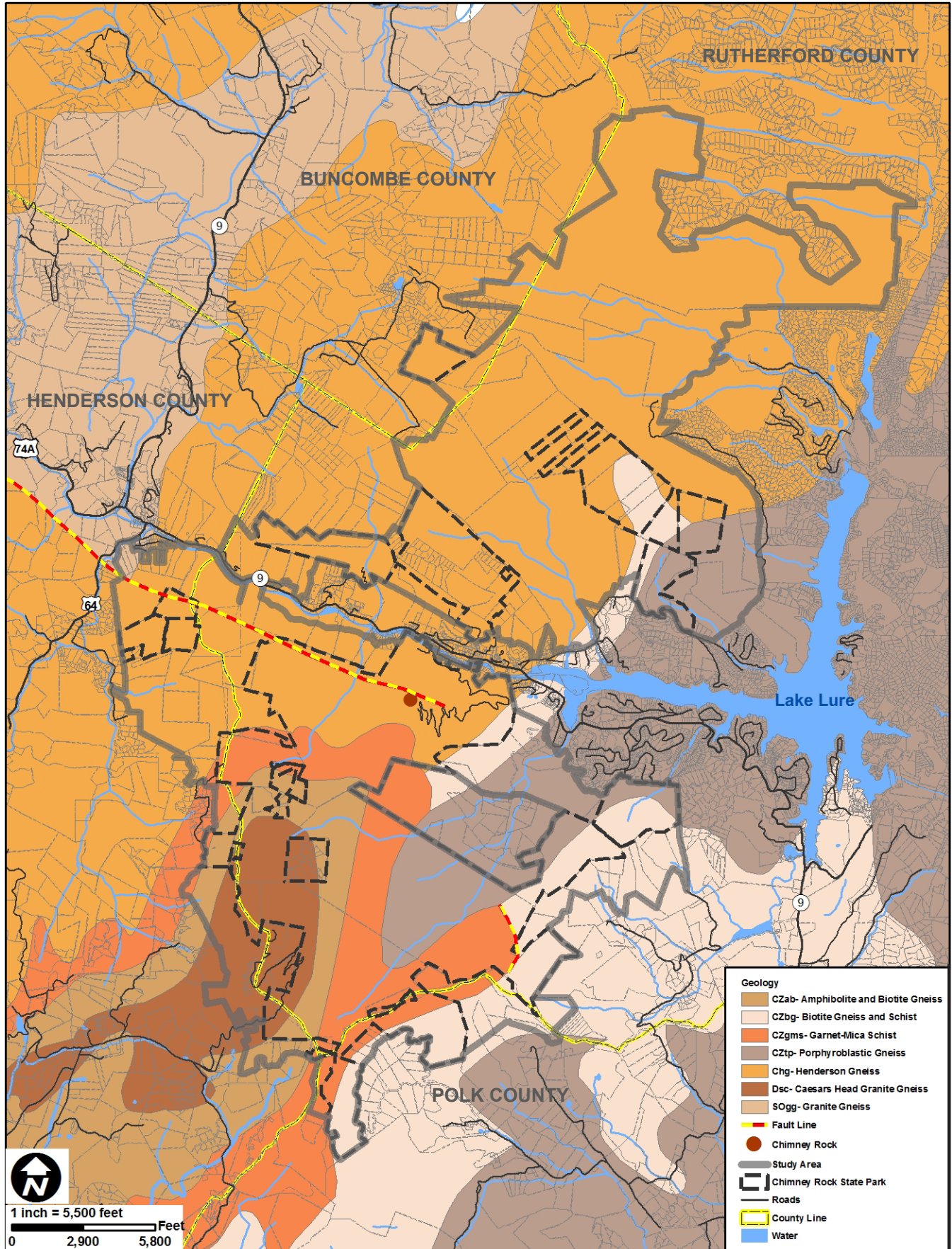


FIGURE 3.10: STUDY AREA GEOLOGY





SOILS

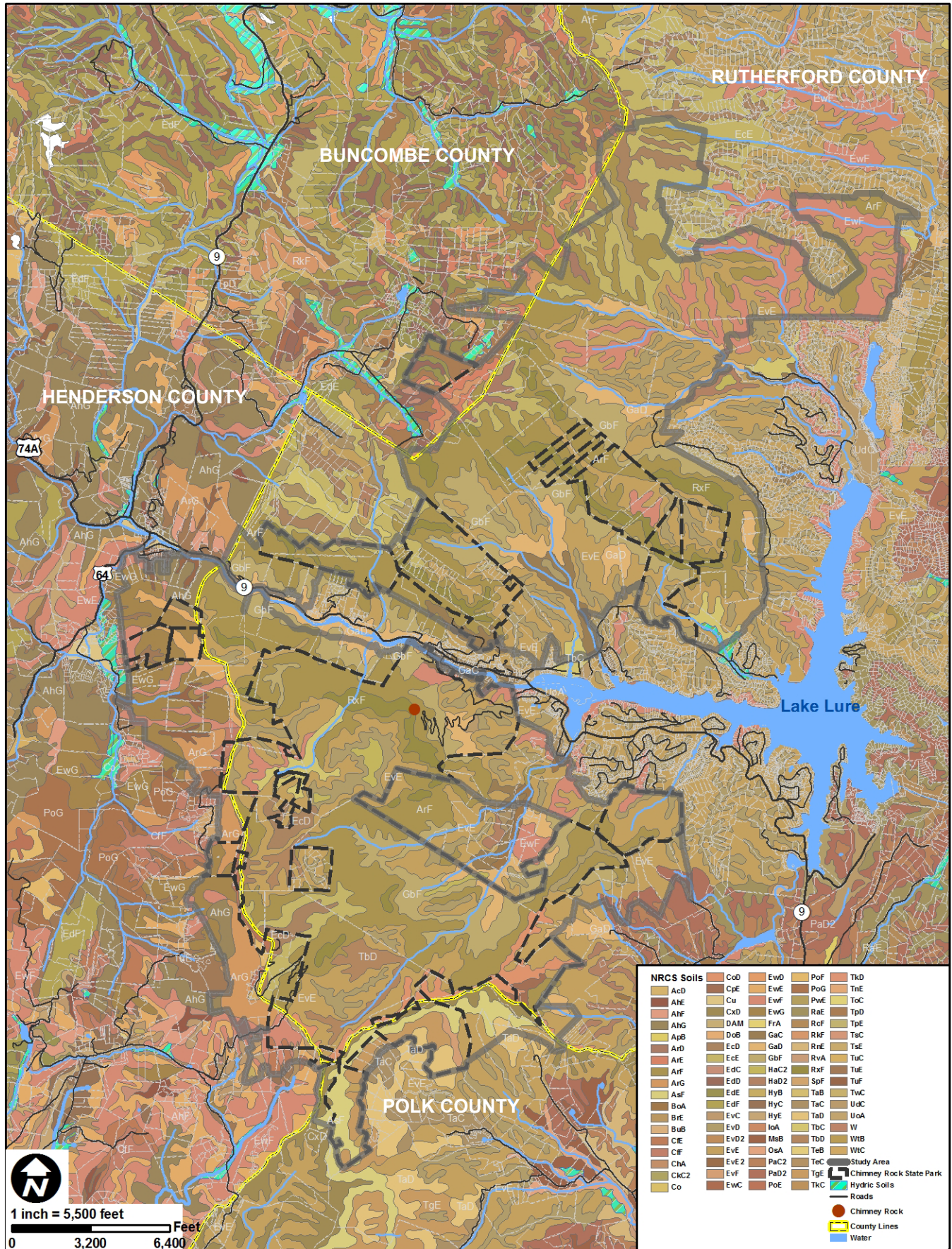
Figure 3.11 displays the many soil units in Chimney Rock State Park and the surrounding study area. Ninety-one different soil units are represented within this area from the data provided by the U.S. Department of Agriculture Natural Resources Conservation Service. Most of the soils within the study area are highly erodible due to steep slopes. A majority of the soils within the park boundary are limited in terms of their ability to support septic fields, small commercial buildings, road construction, campsites, trails, picnic areas, and/or playgrounds because of steep slopes, rock, and poor drainage. The map also displays hydric soils, which indicate the presence of wetlands. Hydric soils are defined as soils that form under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper levels. These soils can be found along several small creeks and tributaries of the Rocky Broad River.



Typical example of exposed rock within the study area.



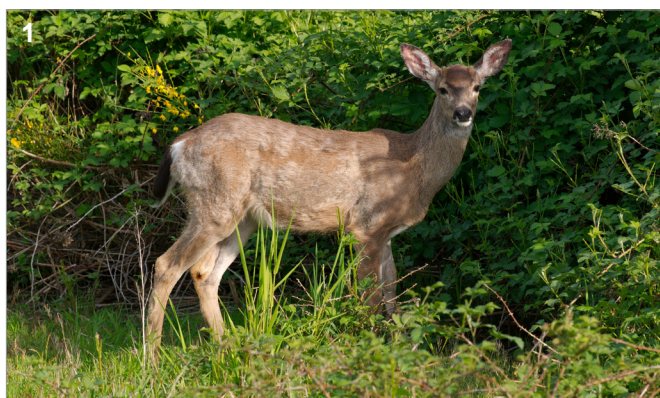
FIGURE 3.11: STUDY AREA SOILS





FLORA, FAUNA AND NATURAL COMMUNITIES

The Chimney Rock State Park study area contains a diverse combination of flora and fauna due to its relationship to two different physiographic regions: the southern Blue Ridge Mountains and the Piedmont. With a substantial gradient in elevation, a varied topography, and the wide range of geology, Chimney Rock State Park supports a diverse set of natural communities as well as a high diversity of plants and animals. The study area contains superb habitat for well-known animal species such as black bear (*Ursus americanus*), white-tailed deer (*Odocoileus virginianus*), gray fox (*Urocyon cinereoargenteus*) and red fox (*Vulpes vulpes*), as well as rare species, including the green salamander (*Aneides aeneus*), the cerulean warbler (*Dendroica cerulean*), and the peregrine falcon (*Falco peregrinus*). The study area is particularly notable for habitats that support a large number of rare plant species, including white irisette (*Sysyrinchium dichotomum*), sweet white trillium (*Trillium simile*), and Carolina saxifrage (*Micranthes caroliniana*).



1 White-tailed deer

2 Black bear

3 Red fox; by R. Laubenstein, US Fish & Wildlife Service

4 Green salamander

5 Peregrine falcon; by Aviceda

6 Cerulean warbler

7 Carolina saxifrage

This study area encompasses all or part of eight Significant Natural Heritage Areas (SNHA) as shown in Figure 3.12. Although heritage areas are often recognized for the presence of rare species, their presence alone does not determine the final significance placed on a particular site. Since biodiversity depends on the long-term conservation of a large number of different species and natural community types, heritage areas are rated based on the cumulative value of their rare species, their high quality natural communities, and their overall biodiversity arising from both rare and common species.



Significant natural areas are critical to the overall ecological, scientific, aesthetic, environmental health, recreational, educational, and cultural values that they provide. SNHA's are classified into one of four rankings:

A - National Significance: Considered to contain examples of natural communities, rare plant or animal populations, or other significant ecological features that are among the highest quality or best (top five or six) examples of their kind in the nation.

B - State Significance: Considered to contain examples of natural communities, rare plant or animal populations, or other significant ecological features that are among the highest quality or best (top five or six) examples of their kind in North Carolina, after any nationally significant examples. There may be comparable (or more significant) sites elsewhere in the nation or within the state.

C - Regional Significance: Considered to contain examples of natural communities, rare plant or animal populations, or other significant ecological features that are represented elsewhere in the state by better examples, but which are among the highest quality or best (top five or six) examples in their geographic region of the state.

D - County Significance: Considered to contain significant biological resources at the county level, but which do not rank at the regional (or higher) level.

Six out of the eight heritage areas in the Chimney Rock State Park study area have an "A" ranking, while the remaining two have a ranking of "B" and "C." "D" ranked communities were not found within the study area.

The eight heritage areas are part of the Hickory Nut Gorge Macrosite which is within a larger area known as the Southeast Escarpment Megasite. The Hickory Nut Gorge Macrosite consists of rugged peaks, gorges, ridge tops, deep coves, and most importantly, large tracts of contiguous forested land. This site is ecologically important for animals that require large areas for breeding and feeding and is ecologically significant because of the diversity and quality of its natural community types. Within the study area alone, nearly 600 plant species have been noted. Across the eight heritage areas that traverse the study area, there are approximately 90 rare plant species, 19 rare animal species, and 14 high quality natural community types (including Watch List species; see Figures 3.13 - 3.17).

SIGNIFICANT NATURAL HERITAGE AREAS

Bald Mountain/Round Top Mountain (740 acres)

This "A" ranked site is significant for high quality examples of several natural community types. These include Low Elevation Granitic Dome, which is scattered throughout the site. An excellent example of Chestnut Oak Forest extends across the upper slopes, and the lower slopes support extensive Montane Oak-Hickory Forest. Particularly notable are the examples of a Spray Cliff community at Rainbow Falls, and the nearly vertical Montane Acidic Cliff community directly opposite the park entrance, at Round Top Mountain. The site has records for seven rare plant species and four rare animal species that are state or federally-listed, including Carolina saxifrage (*Micranthes caroliniana*), lobed spleenwort (*Asplenium pinatifidum*), and green salamander.

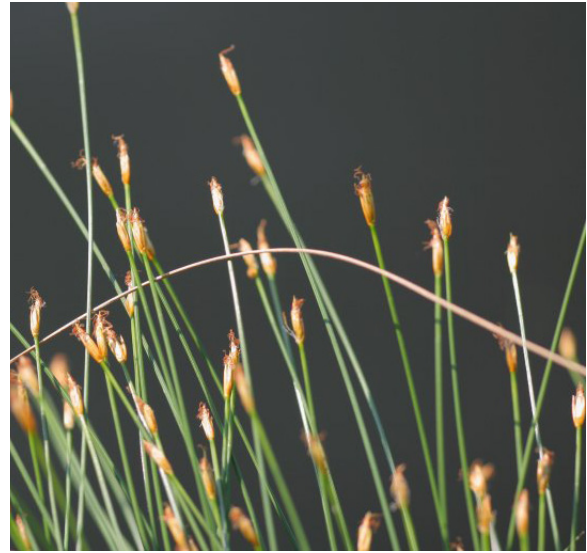


Lobed spleenwort; by John Hilty



Bat Cave/Blue Rock Mountain (549 acres)

This “A” ranked site contains one of the largest caves in North Carolina and the largest fissure cave in the world. The caves are located on the north-facing side of Hickory Nut Gorge, which contains a number of high quality forest communities, granitic domes, and rocky bluffs. Mature, high quality Rich Cove Forest occurs across the rocky low and mid-slopes below the bat caves, and good quality Chestnut Oak Forest occurs above the coves. A good quality example of the rare Carolina Hemlock Bluff occurs near the caves, and excellent examples of Low Elevation Granitic Dome are present. Biodiversity is quite high at this site and includes eight plant species and 10 animal species that are state or federally-listed. These include rock-fire clubmoss (*Huperzia porophila*), deerhair bulrush (*Tricophorum cespitosum*), and Indiana bat (*Myotis sodalis*).



Deerhair bulrush; by Kristian Peters

Cane Creek Mountain (536 acres)

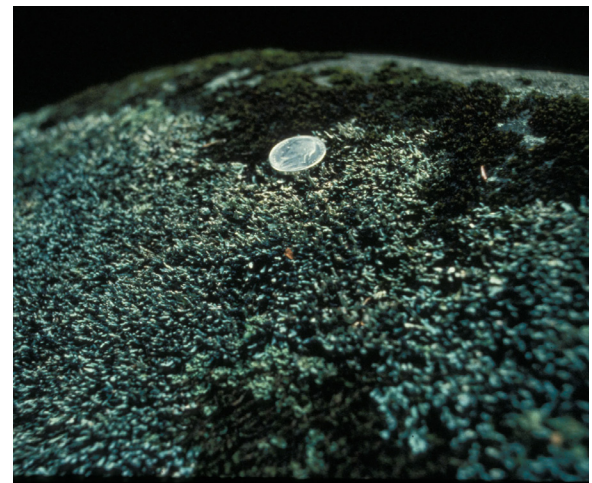
This “A” ranked site is located at the eastern end of Hickory Nut Gorge and is notable for its prominent peak, steep narrow ridges, and rock outcrops that stretch for almost one mile. It has six natural community types, including high quality Rich Cove Forest along the north slopes and summit. Excellent examples of Chestnut Oak Forest are common along the upper slopes, and Canada Hemlock Forest occurs across the lower slopes. Four plant species and four animal species are state or federally-listed, including sweet white trillium (*Trillium simile*) and lampshade spider (*Hypochilus coylei*).



Sweet white trillium; by Bill Swindaman

Chimney Rock Natural Area (1,488 acres)

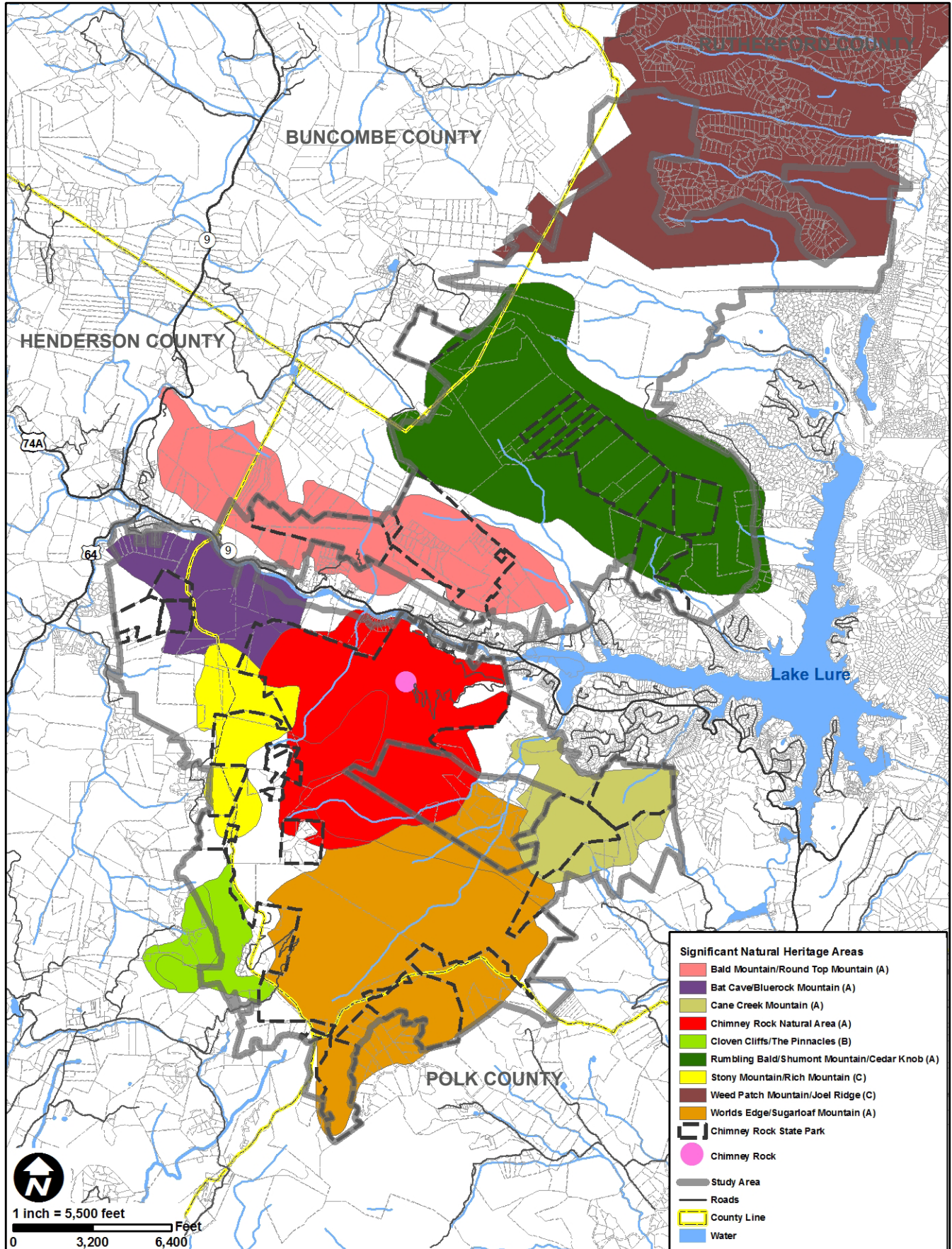
This “A” ranked site contains the Chimney Rock attraction and is one of the most scenic and ecologically significant sites in the study area. It includes eight natural community types, including the very rare Montane Red Cedar–Hardwood Woodland. The park’s namesake peak dominates this rugged site, and most of the steep, northeast and southeast-facing slopes contain good examples of Low Elevation Granitic Dome, mature Rich Cove Forest, and Acidic Cove Forest. The northeast-facing granitic domes support many rare species, and this site has 17 plant species and seven animal species that are state or federally-listed. Notable species include the Peregrine falcon, green salamander, rock gnome lichen (*Gymnoderma lineare*), and Biltmore sedge (*Carex biltmoreana*).



Rock gnome lichen; by U.S. Fish & Wildlife Service



FIGURE 3.12: STUDY AREA SIGNIFICANT NATURAL HERITAGE AREAS





Rumbling Bald/Shumont Mountain/Cedar Knob
(2,276 acres)

The dramatic cliffs at this “A” ranked site are a prominent feature of the study area and are located along the eastern edge of the Blue Ridge Escarpment. It is one of the most significant sites in the Hickory Nut Gorge area due its large size, which supports high quality, contiguous examples of five natural community types. These communities are distributed throughout the site to form a habitat mosaic that allows for unusually high biodiversity. The site includes extensive examples of Low Elevation Granitic Dome, Montane Oak-Hickory Forest, and Chestnut Oak Forest community types. High quality Carolina Hemlock Bluff and Pine-Oak/Heath are also present. The site includes several large fissure caves, which provide habitat for several bat species, including the federally-listed eastern small-footed myotis (*Myotis leibii*). This site has 10 plant species and nine animal species that are state or federally-listed, including sweet pinesap (*Monotropsis odorata*), bleeding heart (*Dicentra eximia*), and eastern woodrat (*Neotoma floridana haematoreia*).



Bleeding heart; by Liz West

Rich Mountain/Stony Mountain (427 acres)

This “C” ranked site is characterized by two prominent peaks on the Rutherford/Henderson County line. Good quality examples of five natural community types occur across its steep and rocky upper slopes and forested lower slopes. Montane Oak-Hickory Forest occurs at the summits of both mountains, with Low Elevation Rocky Summit and Low Elevation Granitic Dome occurring at Stony Mountain and Rich Mountain, respectively. A small Carolina Hemlock Bluff occurs near the summit of Stony Mountain, and there is also an example of Pine-Oak/Heath along the exposed ridges. This is a fire-dependent ecosystem that is dominated by Table Mountain Pine (*Pinus pungens*). The site includes three plant species and one animal species that are state or federally listed, including Blue Ridge bindweed (*Calystegia catesbeiana* ssp. *sericata*) and white irisette.



Bindweed; by J.M. Garg

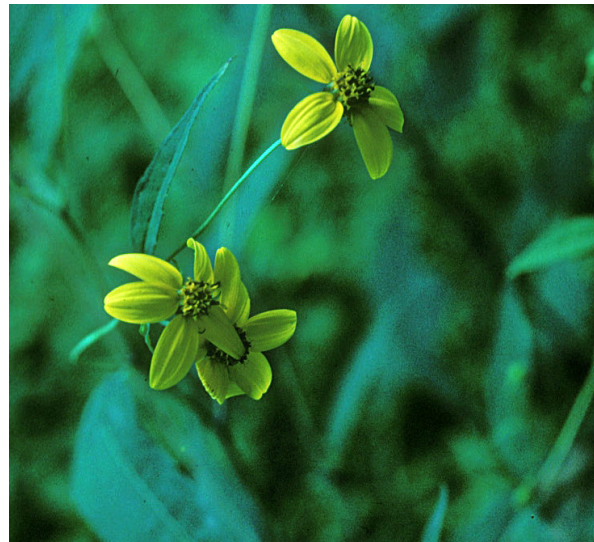
Cloven Cliffs/The Pinnacles (333 acres)

This “B” ranked site is located along the Henderson/Rutherford County border and is notable for the spectacular rock faces at Cloven Cliffs and the large, perched boulders at The Pinnacles. Although the flora at either of these rocky sites is not particularly well-developed or diverse, both sites afford sweeping vistas. Records exist for at least two NC Watch-Listed species, including Biltmore sedge and broadleaf coreopsis (*Coreopsis latifolia*).



Weed Patch Mountain/Joel Ridge (3,968 acres)

Located about one air mile north of Rumbling Bald and Shumont Mountain, this site is significant for its natural community types and presence of two rare species. Several north and south-facing slopes, steep coves, and east-west oriented ridges provide habitat for Montane Oak-Hickory and Pine-Oak/Heath forest. The coves are separated by the eastward-sloping ridges of the Weed Patch Mountain summit. Acidic Cove, Rich Cove, and Dry Oak-Hickory community types occur on the drier slopes and ridge tops. Two rare species are known to occur here, including broad leaf coreopsis (*Coreopsis latifolia*) and green salamander (*Aneides aeneus*), a Federal Species of Concern.



Broadleaf coreopsis; by Rob Sutter

World's Edge/Sugarloaf Mountain (2,100 acres)

This "A" ranked site is another area that is notable for its size, rare species, and overall biodiversity. It takes its name from its location along the eastern edge of the Blue Ridge Escarpment, which falls away dramatically to the Piedmont. This site includes a spectacular, one-mile long series of steep, southeast-facing slopes that supports nine natural community types, including good quality examples of Chestnut Oak Forest and Pine-Oak/Heath. High quality examples of Low Elevation Granitic Dome occur across an extensive array of outcrops, and the very rare Semi-Exfoliated Basic Glade is found at this site. Rich Cove and Acidic Cove occur along the lower slopes, and the uncommon Montane Oak-Hickory Forest type also occurs. Seven plant species and five animal species are state or federally-listed, including shale-barren blazing star (*Liatris turgida*), yellow honeysuckle (*Lonicera flava*), and crevice salamander (*Plethodon yonahlossee*).



Yellow honeysuckle; by R. F. James

NATURAL COMMUNITY TYPES

The descriptions and classifications appearing below for these natural community types are taken from *Classification of the Natural Communities of North Carolina, 3rd Approximation* (1990), by Mike Schafale and Alan Weakley.

Natural communities are characterized by vegetation composition and appearance, assemblages of animals or other organisms, topography, substrate, hydrology, soil characteristics, or other abiotic factors. Natural community types typically occupy subtly different environments that are the result of slight variations in substrate, topography, elevation, aspect, and moisture. The boundaries between community types are rarely distinct, and there is much heterogeneity along elevation and moisture gradients. The result is a constantly evolving vegetation mosaic across the landscape, and in order to efficiently articulate these boundaries, it is common for ecologists to classify community types based on the dominant canopy species, and that is the approach used here.

These ecological units are important because they house examples of unique species compositions and often rare species, they retain many important natural characteristics and ecosystem functions, and they are valuable indicators of a given area's biodiversity. The natural community types on the following pages are known to occur within the Chimney Rock State Park study area.



FIGURE 3.13: SUMMARY OF HIGH QUALITY NATURAL COMMUNITIES IN STUDY AREA

Rich Cove Forest	Montane Red Cedar-Hardwood Woodland
Acidic Cove Forest	Low Elevation Granitic Dome
Canada Hemlock Forest	Low Elevation Rocky Summit
Carolina Hemlock Bluff	Montane Acidic Cliff
Pine-Oak/Heath	Spray Cliff
Chestnut Oak Forest	Low Elevation Seep
Montane Oak-Hickory Forest	Semi-Exfoliated Basic Glade

Rich Cove Forest

Rich Cove Forest community types are widespread and abundant in the Southern Appalachians, and they typically occur in protected coves and slopes on low to moderate elevation sites, frequently with a north-facing aspect. The soils are generally rich, moisture is high, and biological diversity is correspondingly high. These forests are characterized by a diverse and lush herb layer and a closed canopy dominated by a diverse mixture of species, including sweet birch (*Betula lenta*), basswood (*Tilia americana*), and cucumber tree (*Magnolia fraseri*), among others. Rich Coves are one of the most species-diverse community types in eastern North America, especially for the number of tree and herb species that can occur in them.

Acidic Cove Forest

This community type is common in the mountainous regions of North Carolina and in sheltered sites at low to moderate elevations outside of the mountains. It often occurs in narrow rocky gorges, steep ravines, and sheltered valleys and slopes where it is generally moist and humid. These communities occur over more nutrient-poor soils than Rich Cove Forests, primarily due to the presence of relatively acidic soils.

Although it shares a number of canopy dominant species with Rich Cove Forests, the canopy tends to be dominated by a more acid-tolerant subset of species, including red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), and Canada hemlock (*Tsuga canadensis*). This community type is also differentiated from Rich Cove Forests by its shrub layer, which is distinctly and characteristically dominated by ericaceous species such as mountain laurel (*Kalmia latifolia*) that often form dense thickets.

Canada Hemlock Forest

This community is generally less mesic than cove forest sites and occurs in a variety of different locations and aspects including sheltered coves and slopes at middle to high elevations in the mountains and Piedmont. These forests are strongly dominated by Canada hemlock, and they are severely threatened due to the presence of the hemlock woolly adelgid (*Adelges tsugae*), a non-native pest that has affected hemlocks throughout eastern North America. No native predator exists for these insects.

Carolina Hemlock Bluff

This community is considered rare because its dominant species, Carolina hemlock (*Tsuga caroliniana*), is restricted to southern Virginia, western North Carolina, eastern Tennessee, northwestern South Carolina, and northern Georgia. Sites where it is capable of becoming dominant are uncommon. Carolina Hemlock Bluffs usually occur on rocky acidic soils on steep slopes, bluffs, or gorge walls. Like the Canada hemlock Forest, this community type is under attack from the hemlock woolly adelgid.

Pine-Oak/Heath

This community type occurs on very dry, acidic soils of exposed ridgetops and steep, south-facing crests at low to middle elevations. The best examples of this community type occurs in Hickory Nut Gorge along a

few prominent steep and rocky south-facing ridgelines. This is a heterogeneous community that is commonly dominated by stunted and gnarled pine species, particularly Virginia pine (*Pinus virginiana*), Table Mountain pine (*P. pungens*), and pitch pine (*P. rigida*). The shrub layer is generally very dense and is dominated by ericaceous shrubs, most commonly mountain laurel and blueberry (*Vaccinium sp.*) These communities are among the driest and most exposed on the landscape and are unusually prone to wind and lightning. They are believed to be heavily dependent on periodic fire, sometimes severe, in order to maintain the shade-intolerant species that dominate.

Chestnut Oak Forest

This is one of the more common mountain forest communities at low to moderate elevations, and is found throughout Hickory Nut Gorge. The canopy is generally closed, with canopy gaps occurring around rock outcrops. The canopy can be diverse, but is strongly dominated by Chestnut oak (*Quercus montana*) and scarlet oak (*Q. coccinea*), with lesser amounts of northern red oak (*Q. rubra*), white oak (*Q. alba*), various hickory species (*Carya sp.*), and other cove forest species.

Montane Oak-Hickory Forest

This community type is widespread in the mountains of North Carolina, although most prominently south of the Asheville Basin. However, in the South Mountains of Rutherford County, it is mostly limited to the Hickory Nut Gorge area. It occurs on dry to moist slopes and ridgetops that are somewhat exposed at low to high elevations. The canopy is generally closed and is dominated by a mixture of oaks and hickories, with white oak, chestnut oak, northern red oak, mockernut hickory (*Carya alba*), and pignut hickory (*C. glabra*) being the most common.

Montane Red Cedar – Hardwood Woodland

This is a newly described community type that covers rare, open-canopy woodlands on shallow soils over bedrock, containing plants indicative of neutral soil conditions. Eastern red cedar (*Juniperus virginiana*) is abundant, but other oaks and hickories are often also abundant.

Low Elevation Granitic Dome

This community type occurs on upper slopes and summits across the western Piedmont and lower parts of the Blue Ridge and is distinguished from other rock community types by the absence of crevices and deep soil pockets, so that shallow soil mats determine vegetation. The rock surfaces are steep to gently sloping exposures of smooth, exfoliating granite or similar massive igneous or metamorphic rock, such as granitic gneiss. The smooth surfaces and lack of crevices on exfoliation domes create an environment that lacks many of the microhabitats that occur on craggier outcrops.

Low Elevation Rocky Summit

The Low Elevation Rocky Summit occurs on exposed summits at moderate to low elevations in the mountains and the Piedmont. These rare communities are structurally similar to High Elevation Rocky Summits, but are distinct due to the lower elevation and the flora assemblages, as they generally occur under 4,000 ft. in elevation. They can be characterized by the presence of rugged uneven vertical and horizontal rock with little or no canopy present. These sites are typically open and dominated by herbaceous species, but will occasionally support scattered, stunted trees around the margins. Numerous lichens and mosses are also common. These communities are believed to persist in the early stages of primary succession due to a combination of resistant rocks, poor soil development, extreme weather conditions, and natural disturbance, primarily wind, snow, and ice.

Montane Acidic Cliff

This is an uncommon community that occurs on lower to mid slopes where steep to vertical rock is exposed over an area large enough to create a break in the surrounding forest canopy. This is a heterogeneous type, even within a single site, and may range from dry sites on bare rock with shallow soil pockets, to wetter and more sheltered sites on north-facing slopes, to saturated seepage areas. The best developed examples are characterized by bare rock and are dominated by mosses and lichens with only scattered woody species. These sites typically lack a closed shrub layer; however, scattered and stunted trees and shrubs may occur.



Spray Cliff

This community type occurs around waterfalls, and although it is scattered throughout the mountains, it is rare in the upper Piedmont. Examples vary widely, depending on the amount and dependability of spray, but all are generally indicative of unusually equitable and stable environments, where the humidity is high and the moisture supply is essentially constant. Most have very a distinctive flora dominated by bryophytes, mosses, and liverworts, but they may also contain rare species such as Carolina or Carey's saxifrage (*Micranthes caroliniana* and *S. careyana*).



Chimney Rock State Park's natural environment provides an ideal habitat for a diverse range of plants and animals



Low Elevation Seep

This community type generally occurs in low lying areas along or near small streams, with seepage generally flowing towards a larger adjacent stream. They are fairly common, but never extensive, and are usually saturated and mucky. The canopy is usually closed and is typically dominated by species such as yellow poplar, red maple, sycamore (*Platanus occidentalis*), and river birch (*Betula nigra*).

Semi-Exfoliated Basic Glade

This is a newly-described community type that is believed to be rare. It occurs on gently to moderately sloping low elevation outcrops with irregular surfaces but few crevices, and supports plants characteristic of higher pH conditions. Their rocky structure is intermediate between Granitic Domes and Rocky Summits, and they are vegetatively similar to Low Elevation Granitic Domes, with plants occurring in grassy mats.

STATUS AND SUPPLEMENTARY DESIGNATIONS FOR RARE PLANT AND ANIMAL SPECIES

Animal and plant species that are state-listed as Endangered, Threatened or Special Concern are protected under N.C. General Statutes by the N.C. Wildlife Resources Commission and the N.C. Plant Conservation Program, respectively. Plant or animal species classified as Significantly Rare or Watch List do not have legal protection. Species with federal classifications of Endangered or Threatened are protected by the U.S. Fish and Wildlife Service under the Endangered Species Act of 1973. Species that are listed as Candidate or Federal Species of Concern (FSC) have no federal protection. Rare plant and animal species known to occur in the study area are listed in Figures 3.13 and 3.14. Status codes are defined below.

E	Endangered	A species in danger of extinction throughout all or a significant part of its range.
T	Threatened	A species that is likely to become an Endangered species in the near future throughout all of its range or a significant part of it.
SC	Special Concern	A species which has some evidence of vulnerability, but not enough data to support a listing of Endangered or Threatened.
SR	Significantly Rare	Indicates rarity and the need for population monitoring and possible conservation for species currently listed as Endangered, Threatened, or Special Concern.



FIGURE 3.14: SUMMARY OF SPECIAL STATUS PLANT SPECIES IN STUDY AREA

SCIENTIFIC NAME	COMMON NAME	STATE STATUS	FEDERAL STATUS
Rare Plant Species			
<i>Amelanchier sanguinea</i>	Roundleaf Serviceberry	SR-P	—
<i>Arabis patens</i>	Spreading Rockcress	SR-T	—
<i>Asplenium bradleyi</i>	Bradley's Spleenwort	SR-P	—
<i>Asplenium pinnatifidum</i>	Lobed Spleenwort	SR-P	—
<i>Calamagrostis porteri</i>	Porter's Reed Grass	SR-P	—
<i>Cardamine dissecta</i>	Dissected Toothwort	SR-P	—
<i>Carex baileyi</i>	Bailey's Sedge	SR-P	—
<i>Celastrus scandens</i>	American Bittersweet	SR-P	—
<i>Clematis catesbyana</i>	Coastal Virgin's-bower	SR-P	—
<i>Cyrto-hypnum pygmaeum</i>	Pygmy Cyrto-hypnum Moss	SR-O	—
<i>Dicentra eximia</i>	Bleeding Heart	SR-P	—
<i>Draba ramosissima</i>	Branching Draba	SR-P	—
<i>Fothergilla major</i>	Large Witch-alder	SR-T	—
<i>Gymnoderma lineare</i>	Rock Gnome Lichen	T	E
<i>Hexalectris spicata</i>	Crested Coralroot Orchid	SR-P	—
<i>Huperzia porophila</i>	Rock-fir Clubmoss	SR-P	—
<i>Isotria medeoloides</i>	Small Whorled Pogonia	E	T
<i>Liatris squarrulosa</i>	Earle's Blazing-star	SR-P	—
<i>Liatris turgida</i>	Shale-barren Blazing-star	SR-T	—
<i>Micranthes caroliniana</i>	Carolina Saxifrage	SR-T	—
<i>Monotropsis odorata</i>	Sweet Pinesap	SR-T	FSC
<i>Packera millefolium</i>	Divided-leaf Ragwort	T	FSC
<i>Parthenium auriculatum</i>	Glade Wild Quinine	SR-T	—
<i>Prenanthes alba</i>	White Rattlesnakeroot	SR-P	—
<i>Primula meadia</i>	Eastern Shooting-Star	SR-P	—
<i>Robinia hispida</i> var. <i>kelseyi</i>	Kelsey's Locust	SR-O	—
<i>Rhynchospora alba</i>	Northern White Beaksedge	SR-P	—
<i>Sisyrinchium dichotomum</i>	White Irisette	E	E
<i>Solidago simulans</i>	Granite Dome Goldenrod	SR-L	FSC
<i>Trichophorum cespitosum</i>	Deerhair Bulrush	SR-D	—
<i>Trillium simile</i>	Sweet White Trilium	SR-L	—

Notes:

State Status: E - Endangered; T - Threatened; SC - Special Concern; SR - Significantly Rare; W - Watch List

Federal Status: E - Endangered; FSC - Federal Species of Concern; T - Threatened



Species that are listed as Significantly Rare (SR) also include a supplementary designation indicating if its range. Supplementary designation definitions are defined below.

L	Limited	The range of the species is limited to North Carolina and adjacent states (endemic or nearly so). These are species that may have 20-50 populations in North Carolina, and their fate depends largely on their conservation in North Carolina.
T	Throughout	The species is rare throughout its entire range, with <100 populations total.
D	Disjunct	The species is disjunct to North Carolina from its main range in a different part of the country or world.
P	Peripheral	The species is at the periphery of its range in North Carolina, mostly in habitats that are unusual in North Carolina.
O	Other	The species' range is sporadic or cannot be described by the other categories.

FIGURE 3.15: SUMMARY OF SPECIAL STATUS ANIMAL SPECIES IN STUDY AREA

SCIENTIFIC NAME	COMMON NAME	STATE STATUS	FEDERAL STATUS
Rare Animal Species			
<i>Aneides aeneus</i>	Green Salamander	E	FSC
<i>Crotalus horridus</i>	Timber Rattlesnake	SC	—
<i>Dendroica cerulea</i>	Cerulean Warbler	SC	FSC
<i>Falco peregrinus</i>	Peregrine Falcon	E	—
<i>Hypochilus coylei</i>	Lampshade Spider	SR	—
<i>Myotis grisescens</i>	Gray Myotis	E	E
<i>Myotis leibii</i>	Eastern Small-footed Myotis	SC	FSC
<i>Myotis sodalis</i>	Indiana Bat	E	E
<i>Nesticus brimleyi</i>	Nesticid Spider	SR	—
<i>Plethodon amplus</i>	Blue Ridge Gray-cheeked Salamander	SR	—
<i>Plethodon yonahlosse pop. 1</i>	Crevice Salamander	SC	—
<i>Pseudosinella gisini</i>	Cave-obligate Springtail	SR	—

Notes:

State Status: E - Endangered; T - Threatened; SC - Special Concern; SR - Significantly Rare; W - Watch List

Federal Status: E - Endangered; FSC - Federal Species of Concern

Watch List species include those that are rare or otherwise threatened with serious decline, but for which current information does not justify placement on the main rare species list as Endangered, Threatened, Special Concern, or Significantly Rare. These species are additional indicators of significant habitats, and their presence should be considered in planning natural area protection efforts, although with less weight than higher priority rare species and natural communities. Watch List species can be found in Figures 3.16 and 3.17.



FIGURE 3.16: SUMMARY OF WATCH LIST ANIMAL SPECIES IN STUDY AREA

SCIENTIFIC NAME	COMMON NAME
Watch List Animal Species	
<i>Corvus corax</i>	Common Raven
<i>Falco sparverius</i>	American Kestrel
<i>Lampropeltis triangulum triangulum</i>	Eastern Milk Snake
<i>Limnothlypis swainsonii</i>	Swainson's Warbler
<i>Myotis septentrionalis</i>	Northern Long-eared Myotis
<i>Neotoma floridana haematoreia</i>	Southern Appalachian Eastern Woodrat
<i>Sorex hoyi winnemana</i>	Southern Pygmy Shrew

FIGURE 3.17: SUMMARY OF WATCH LIST PLANT SPECIES IN STUDY AREA

SCIENTIFIC NAME	COMMON NAME
Watch List Plant Species	
<i>Anemone quinquefolia</i>	Wood Anemone
<i>Aralia racemosa</i>	American Spikenard
<i>Aronia prunifolia</i>	Purple Chokecherry
<i>Asplenium montanum</i>	Mountain Spleenwort
<i>Asplenium resiliens</i>	Blackstem Spleenwort
<i>Calystegia catesbeiana</i>	Blue Ridge Bindweed
<i>Campanulastrum americanum</i>	Tall Bellflower
<i>Carex albursina</i>	White Bear Sedge
<i>Carex biltmoreana</i>	Biltmore Sedge
<i>Carex leavenworthii</i>	Leavenworth's Sedge
<i>Carex ruthii</i>	Ruth's Sedge
<i>Castilleja coccinea</i>	Scarlet Indian-paintbrush
<i>Chamaelirium luteum</i>	Devil's Bit
<i>Clematis catesbyana</i>	Coastal Virgin's-bower
<i>Coreopsis latifolia</i>	Broadleaf Coreopsis
<i>Cornus alternifolia</i>	Alternate-leaf Dogwood
<i>Cypripedium parviflorum var. pubescens</i>	Large Yellow Lady's-slipper
<i>Dicanthelium latifolium</i>	Broadleaf Witch Grass
<i>Dicentra cucullaria</i>	Dutchman's Breeches
<i>Diplazium pycnocarpon</i>	Glade Fern
<i>Drosera rotundifolia</i>	Roundleaf Sundew
<i>Eupatorium steelii</i>	Appalachian Joe-Pye-Weed
<i>Fallopia scandens var. 1</i>	Crested Climbing Buckwheat
<i>Fothergilla major</i>	Large Witch Alder
<i>Galax urceolata</i>	Galax
<i>Goodyera repens</i>	Lesser Rattlesnake-orchid
<i>Heuchera parviflora var. parviflora</i>	Grotto Alumroot
<i>Heuchera parviflora</i>	Littleleaf Alumroot

FIGURE 3.17: (CONT'D.) SUMMARY OF WATCH LIST PLANT SPECIES IN STUDY AREA

SCIENTIFIC NAME	COMMON NAME
Watch List Plant Species	
<i>Huperzia appressa</i>	Appalachian Fir-clubmoss
<i>Hydrophyllum canadense</i>	Blunt-leaf Waterleaf
<i>Hydrangea cinerea</i>	Ashy Hydrangea
<i>Ilex ambigua</i>	Carolina Holly
<i>Juglans cinerea</i>	Butternut
<i>Krigia montana</i>	Mountain Cynthia
<i>Lonicera flava</i>	Yellow Honeysuckle
<i>Micranthes careyana</i>	Carey's Saxifrage
<i>Micranthes micranthidifolia</i>	Lettuce-leaf Saxifrage
<i>Muhlenbergia mexicana</i>	Mexican Muhly
<i>Muhlenbergia sylvatica</i>	Woodland Muhly
<i>Panax quinquefolius</i>	Ginseng
<i>Pellaea atropurpurea</i>	Purple Stem Cliff-Bake
<i>Penstemon smallii</i>	Small's Beardtongue
<i>Philadelphus hirsutus</i>	Hairy Mock-Orange
<i>Philadelphus inodorus</i>	Scentless Mock-Orange
<i>Pinus strobus</i>	Eastern White Pine
<i>Ptelea trifoliata</i>	Wafer Ash
<i>Rhododendron minus</i>	Carolina Rhododendron
<i>Salix humilis</i>	Tall Prairie Willow
<i>Sanguinaria canadensis</i>	Bloodroot
<i>Sphenopholis intermedia</i>	Prairie Wedgescale
<i>Stenanthium gramineum</i>	Eastern Featherbells
<i>Thuja occidentalis</i>	American Arborvitae
<i>Tsuga canadensis</i>	Eastern Hemlock
<i>Tsuga caroliniana</i>	Carolina Hemlock
<i>Trillium rugelii</i>	Southern Nodding Trillium
<i>Trillium cuneatum</i>	Little Sweet Betsy
<i>Verbesina virginica</i> var. <i>virginica</i>	Common Frostweed
<i>Viola blanda</i>	Smooth White Violet



LAND COVER

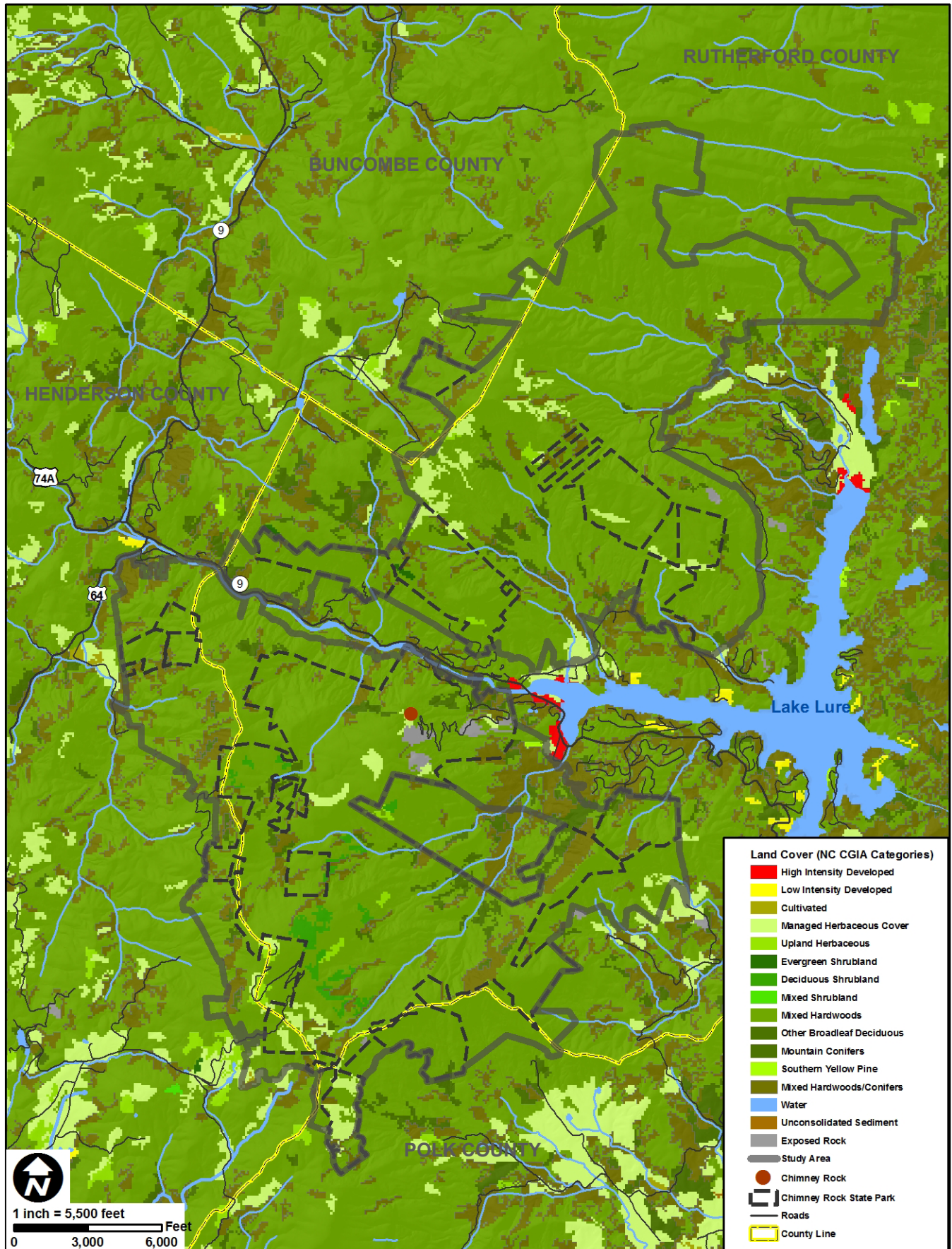
Figure 3.18 illustrates the land cover for Chimney Rock State Park and the surrounding study area. The data for this map was obtained from the North Carolina Center for Geographic Information and Analysis (CGIA) (1996). This map displays 16 different land cover types based on analysis from satellite imagery. The most common types of land cover shown on the map are mixed hardwoods (77% of study area), mixed hardwoods/conifers (13%), and mountain conifers (4%). The Town of Lake Lure and Chimney Rock Village can be seen as high intensity developed areas. This map helps to illustrate the densely wooded and contiguous forests in the area of the park.



View looking east to Lake Lure showing tree cover in and around the park



FIGURE 3.18: STUDY AREA LAND COVER





BIODIVERSITY AND WILDLIFE HABITAT

Biodiversity and wildlife habitat assessment data was obtained through the Conservation Planning Tool for North Carolina initially developed by an assessment team made up of N.C. Natural Heritage Program staff, and then reviewed by field ecologists, biologists and botanists from several state environmental agencies. This data compiles a multitude of complex variables that contribute to biodiversity and habitat assessment. Generally, for assessment of biodiversity, the available data represents three major components of ecological resources. These are: biodiversity, both of aquatic and terrestrial species and communities; large scale terrestrial landscapes, including core wildlife habitats and habitat connectors; and other lands of particular importance to ecosystem processes, such as riparian buffers and wetlands.

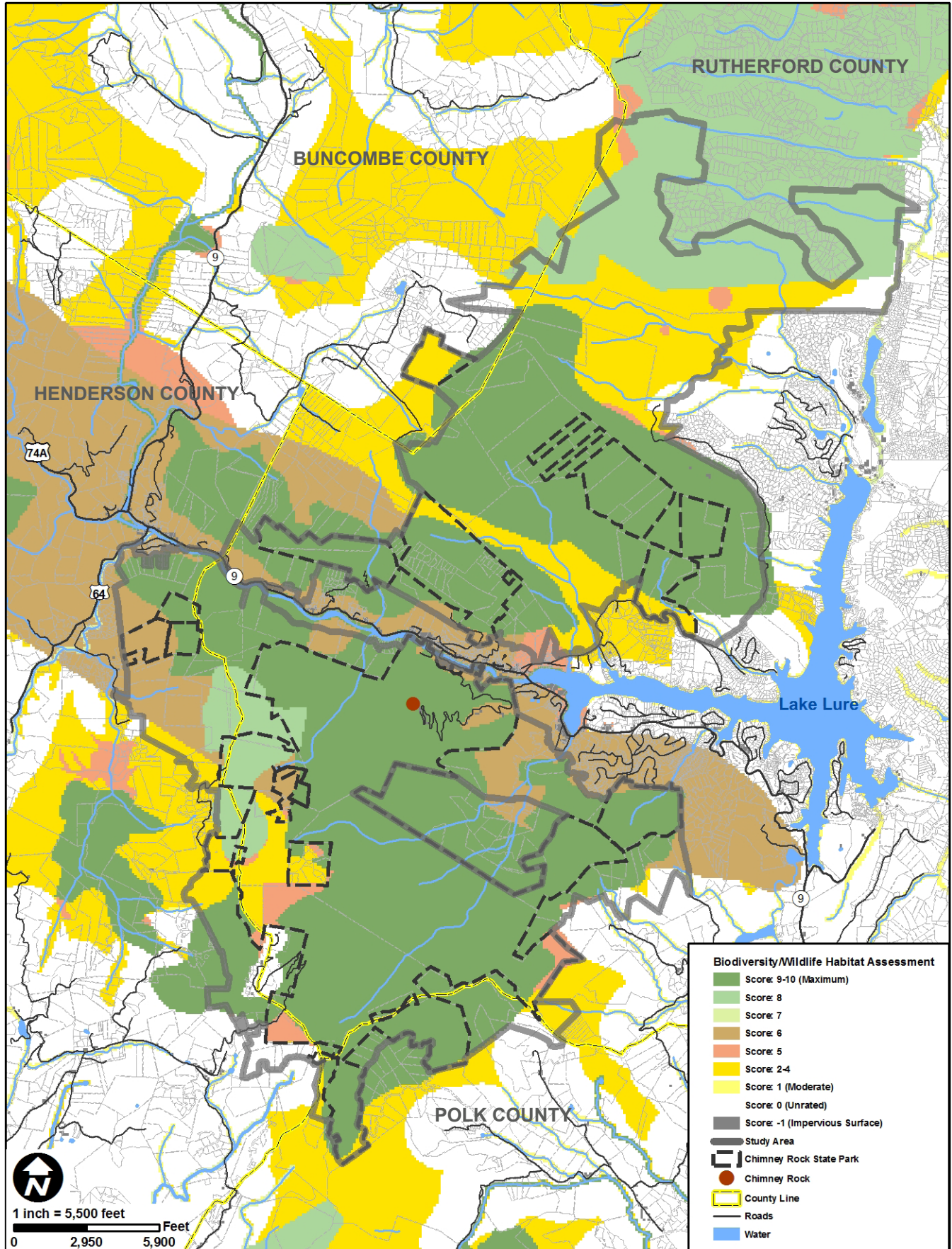
As seen in Figure 3.19, a majority of the study area within Chimney Rock State Park are ranked at 9-10, the highest relative conservation value for biodiversity and wildlife habitat. The map shows “islands” of these high rankings bordered by middle to low relative conservation values.



Flame azalea located within the study area



FIGURE 3.19: STUDY AREA BIODIVERSITY AND WILDLIFE HABITAT ASSESSMENT





FIRE MANAGEMENT

Hickory Nut Gorge supports a number of fire prone and fire adapted natural community types and species, particularly on dry, south-facing slopes and ridges that are dominated by Pine-Oak Heath natural communities. The long term fire history of the area is largely unknown and although some natural community types such as the moist cove forests and hemlock forests are not generally considered to be fire adapted, fire is known to be ecologically important in this part of the southern Blue Ridge Escarpment. Evidence of past fires are common across the landscape and several wildfires have occurred in the Hickory Nut Gorge in the past decade. A fire management plan incorporating both prescribed fire and wildfire response will be developed collaboratively by the N.C. Division of Parks and Recreation, the N.C. Division of Forest Resources, local fire departments, and land conservation organizations.



Fire management at Chimney Rock State Park.



Prescribed burning has ecological importance in the southern Blue Ridge Escarpment.



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